Social variables and their measurement in epidemiologic studies

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Outline

- What are social variables?
- Examples of social variables in epidemiologic studies
- Measurement
- Social variables in biomedical research
Types of variables

- Biologic variables
- Behavioral or “lifestyle” variables
- Social variables
Social variables

• Characterize or reflect ways in which individuals are related to each other in groups

• Levels of organization
  - Society
  - Groups
  - Individuals
Themes in the study of “social” variables

- Social gradient
- Life course effects
- Psychosocial characteristics
- Group-level measures
The Social Gradient

All-cause Mortality by Income, NLMS, 25+ Years
• What explains the gradient?
  – Absolute vs. relative position
  – Material or psychosocial explanations

• Can we eliminate the gradient by blocking proximal pathways?

• Common vs. different mechanisms
**Life course**

**TABLE 4.** Socioeconomic predictors of cardiovascular disease mortality, Alameda County Health Study, Alameda County, California, 1965–1996

<table>
<thead>
<tr>
<th>Variable</th>
<th>Age-adjusted hazard ratio</th>
<th>95% confidence interval</th>
<th>Multivariable-adjusted hazard ratio</th>
<th>95% confidence interval</th>
<th>Multivariable-adjusted hazard ratio</th>
<th>95% confidence interval</th>
<th>Multivariable-adjusted hazard ratio</th>
<th>95% confidence interval</th>
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<tr>
<td>Childhood socioeconomic position</td>
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<tr>
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<td>1.00</td>
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<tr>
<td>Low</td>
<td>1.34</td>
<td>1.13, 1.58</td>
<td>1.31</td>
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<td>1.30</td>
<td>1.09, 1.54</td>
<td>1.29</td>
<td>1.09, 1.54</td>
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<td>Education</td>
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<td>1.00</td>
<td>1.00</td>
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<tr>
<td>Medium</td>
<td>1.09</td>
<td>0.90, 1.32</td>
<td>1.00</td>
<td>0.82, 1.23</td>
<td>0.99</td>
<td>0.81, 1.22</td>
<td>0.99</td>
<td>0.80, 1.21</td>
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<td>0.85, 1.36</td>
<td>1.06</td>
<td>0.84, 1.34</td>
<td>1.00</td>
<td>0.79, 1.28</td>
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<td>Occupation</td>
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<tr>
<td>Manual</td>
<td>1.08</td>
<td>0.85, 1.39</td>
<td>0.94</td>
<td>0.73, 1.23</td>
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<td>0.75, 1.34</td>
<td>0.96</td>
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<td>Housewife</td>
<td>1.11</td>
<td>0.92, 1.34</td>
<td>1.06</td>
<td>0.88, 1.28</td>
<td>0.98</td>
<td>0.80, 1.19</td>
<td>0.99</td>
<td>0.80, 1.21</td>
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<tr>
<td>Annual household income</td>
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<td></td>
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<tr>
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<td>1.00</td>
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<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Medium</td>
<td>1.51</td>
<td>1.20, 1.90</td>
<td>1.49</td>
<td>1.18, 1.88</td>
<td>1.41</td>
<td>1.08, 1.84</td>
<td>1.42</td>
<td>1.08, 1.86</td>
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<tr>
<td>Low</td>
<td>1.44</td>
<td>1.15, 1.82</td>
<td>1.40</td>
<td>1.11, 1.77</td>
<td>1.44</td>
<td>1.11, 1.86</td>
<td>1.47</td>
<td>1.14, 1.91</td>
</tr>
</tbody>
</table>

* Multivariable model simultaneously adjusts for age (as a continuous variable), baseline household income, childhood socioeconomic position, education, and baseline occupation.
† Multivariable model with income and occupation as time-varying covariates.
‡ Multivariable model also includes smoking status, body mass index, and physical activity as time-varying covariates.
Life course

Figure 1. Social mobility and health outcomes (estimated means and 95% confidence intervals adjusted for gender, race/ethnicity, age, and childhood health).

Luo and Waite 2005
• Disentangling early vs. late effects

• Mechanisms
  – Critical periods
  – Cumulative effects
  – Interactions
Psychosocial variables

Social Network Index and Age
Berkman and Syme 1979

Cohen et al. 1997
Quartiles of Hostility and Risk of CVD: KIHD

Risk factor-adjusted models included covariates for biological, socioeconomic, & behavioral factors, social support, and prevalent diseases.

Everson et al 1997
• Behavioral mediators/confounders or “direct” biologic effects?

• Determinants of psychosocial attributes
Group-level variables

• Groups as more than collections of individuals

• “Contextual” effects of group-level attributes

• Interaction between group and individual-level attributes
Odds ratios of fair or poor self-rated health by levels of social capital indicators: BRFSS, 1993-1994

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Trust</td>
<td>1.67 (1.56, 1.75)</td>
<td>1.41 (1.33, 1.50)</td>
</tr>
<tr>
<td>Medium Trust</td>
<td>1.41 (1.35, 1.45)</td>
<td>1.14 (1.08, 1.21)</td>
</tr>
<tr>
<td>High Trust</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Low group membership</td>
<td>1.43 (1.34, 1.55)</td>
<td>1.22 (1.14, 1.32)</td>
</tr>
<tr>
<td>Medium group membership</td>
<td>1.18 (1.13, 1.25)</td>
<td>1.11 (1.05, 1.16)</td>
</tr>
<tr>
<td>High group membership</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Model 1 is adjusted for age, sex and race. Model 2 is also adjusted for income, living alone, smoking, obesity, health insurance, and health care utilization.

Kawachi et al 1997
Hazard ratios of coronary heart disease by race-specific tertiles of neighborhood score before and after adjustment: the ARIC Study 1987-96

<table>
<thead>
<tr>
<th>Race-specific tertiles of neighborhood score*</th>
<th>Adjusted for age &amp; center</th>
<th>Adjusted for age, center, income, education &amp; occupation†</th>
<th>+ behavioral and biomedical risk factors‡</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whites</td>
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</tr>
<tr>
<td>I (Low)</td>
<td>2.1 (1.6-2.8)</td>
<td>1.7 (1.3-2.3)</td>
<td>1.6 (1.1-2.2)</td>
</tr>
<tr>
<td>II</td>
<td>1.7 (1.3-2.3)</td>
<td>1.5 (1.2-2.1)</td>
<td>1.5 (1.1-2.0)</td>
</tr>
<tr>
<td>III (High)</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>P trend</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.008</td>
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<tr>
<td>African-Americans</td>
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<tr>
<td>I (Low)</td>
<td>1.7 (1.2-2.3)</td>
<td>1.4 (0.9-2.0)</td>
<td>1.5 (1.0-2.3)</td>
</tr>
<tr>
<td>II</td>
<td>1.4 (1.0-2.1)</td>
<td>1.3 (0.9-1.9)</td>
<td>1.5 (1.0-2.4)</td>
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<tr>
<td>III (High)</td>
<td>1.0</td>
<td>1.0</td>
<td>0.09</td>
</tr>
<tr>
<td>P trend</td>
<td>0.003</td>
<td>0.1</td>
<td>0.1</td>
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</table>

Diez Roux at al NEJM 2001
• Multilevel approaches

• Defining the relevant “groups” and group-level attributes

• Role of individual-level variables
Measurement of social variables (I)

- Level of organization
  - Individuals
    - Psychosocial characteristics (social connectedness, affect, hostility, optimism etc.)
    - Socioeconomic position
  - Groups
    - Structure of social networks, social cohesion, inequality
  - Society
    - Organization of work, macro economic conditions
Measurement of social variables (II)

- Time
  - Lifecourse
  - Lags
Measurement of social variables (III)

• Instruments
  – Theory
  – Scales
  – Ecological measurement
Models for the incorporation of social factors in biomedical research

• Social factors as antecedents for biologic processes

• Social factors as modifiers of biologic/genetic effects

• Social factors as integral parts of biologic systems
Social as antecedent to biological

FIGURE 6. Model of the pathways by which SES influences health.

Adler and Ostrove, 1999
Social as antecedent to biological Clustering of interacting risk factors

FIGURE 6. Model of the pathways by which SES influences health.

Adler and Ostrove, 1999
Fig 1. Results of regression analyses estimating the association between number of stressful life events (between ages 21 and 26 years) and depression outcomes at age 26 as a function of 5-HTT genotype. Caspi et al. Science 2003
Interrelations between social and biological over time

- Intrauterine environment and health in adulthood
Interrelations between social and biological over time and across generations

• Biological embedding of early experience
Dynamic systems at multiple levels
“If we consider disease to be embedded in a complex network in which biologic, social, and physical factors all interact, then we are impelled to develop new models and adopt different analytic methods.”

R. Stallones, 1973